

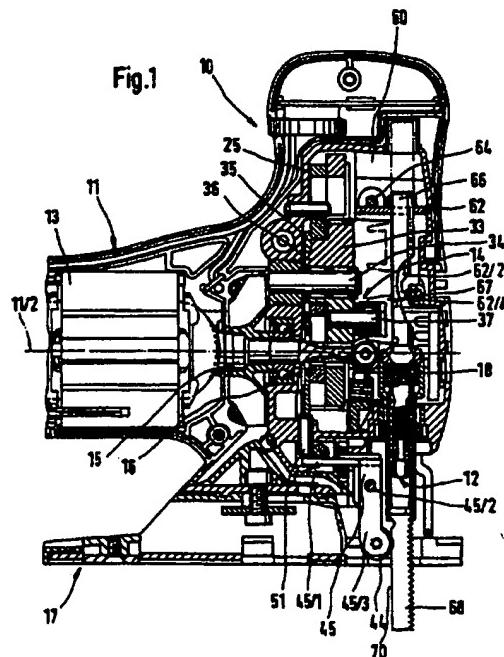
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(71) Applicant(s) Scintilla AG (Incorporated in Switzerland) PO Box 632, 4501 Solothurn, Switzerland				(58) Field of Search UK CL (Edition P) B5L LAA LAB LAS LDS LDX LK INT CL ⁶ B23D 49/16 51/16, B27B 19/02 19/04
(72) Inventor(s) Beat Kaech Matthias Winter				
(74) Agent and/or Address for Service A A Thornton & Co Northumberland House, 303-306 High Holborn, LONDON, WC1V 7LE, United Kingdom				

(54) Abstract Title
Hand-guided jig saw machine

(57) In a hand-guided jig saw machine (10) having a machine housing (11), in which a lifting rod (66) is guided so as to be movable up and down, which lifting rod at its bottom end carries a saw blade (68) held by a clamping device (12) with a clamp sleeve as a releasable holder, wherein close to the bottom end of the lifting rod (66) a roller lever (45) is mounted so as to be capable of swivelling in forward feed direction and is drivable in an oscillating manner, wherein the back (70) of the saw blade (68) is supportable against the oscillating roller (44) of the roller lever, a particularly precise oscillating mechanism is provided in that there is operationally connected to the roller lever (45) a push rod (51) which is moved in a reciprocating manner by the motor (13).



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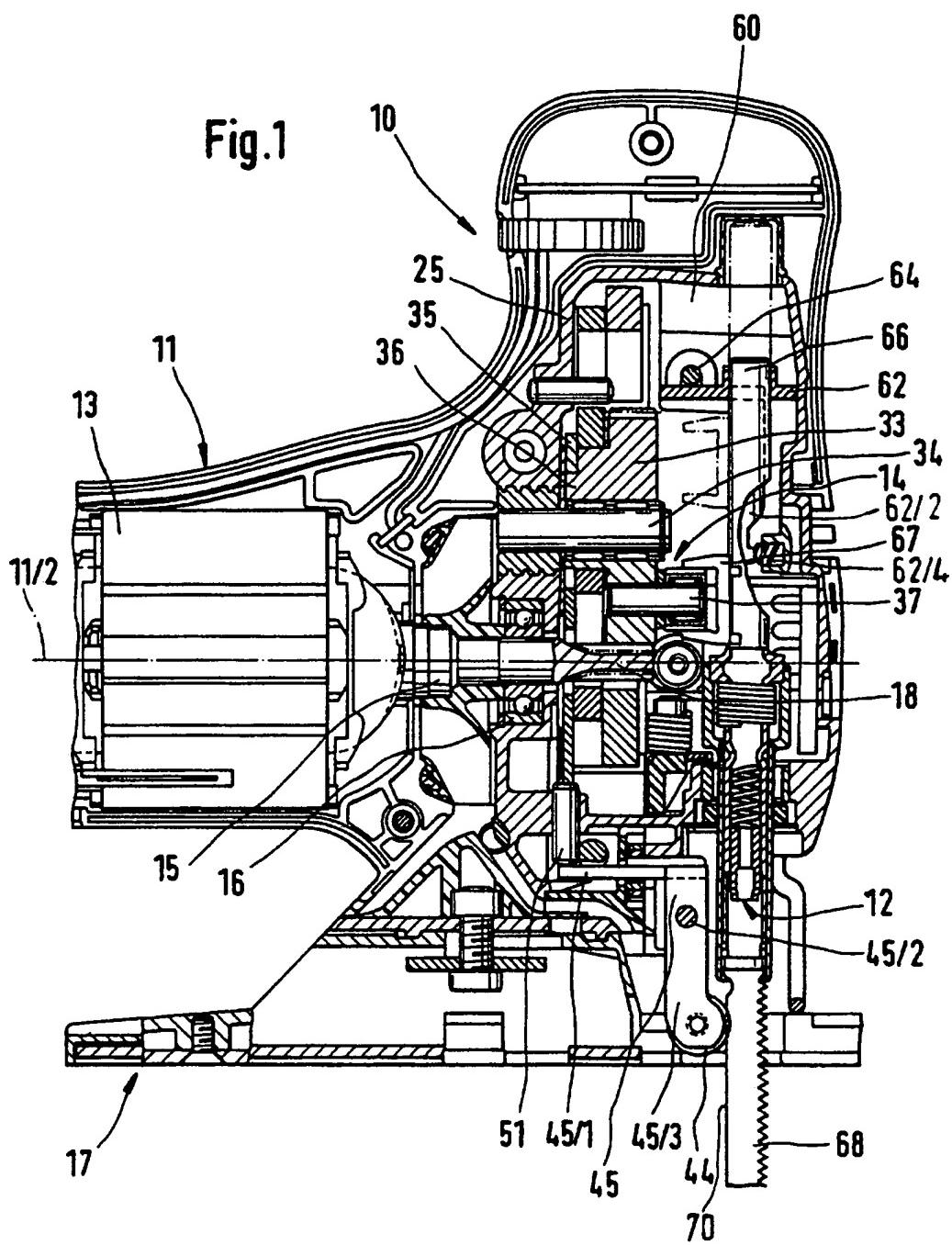
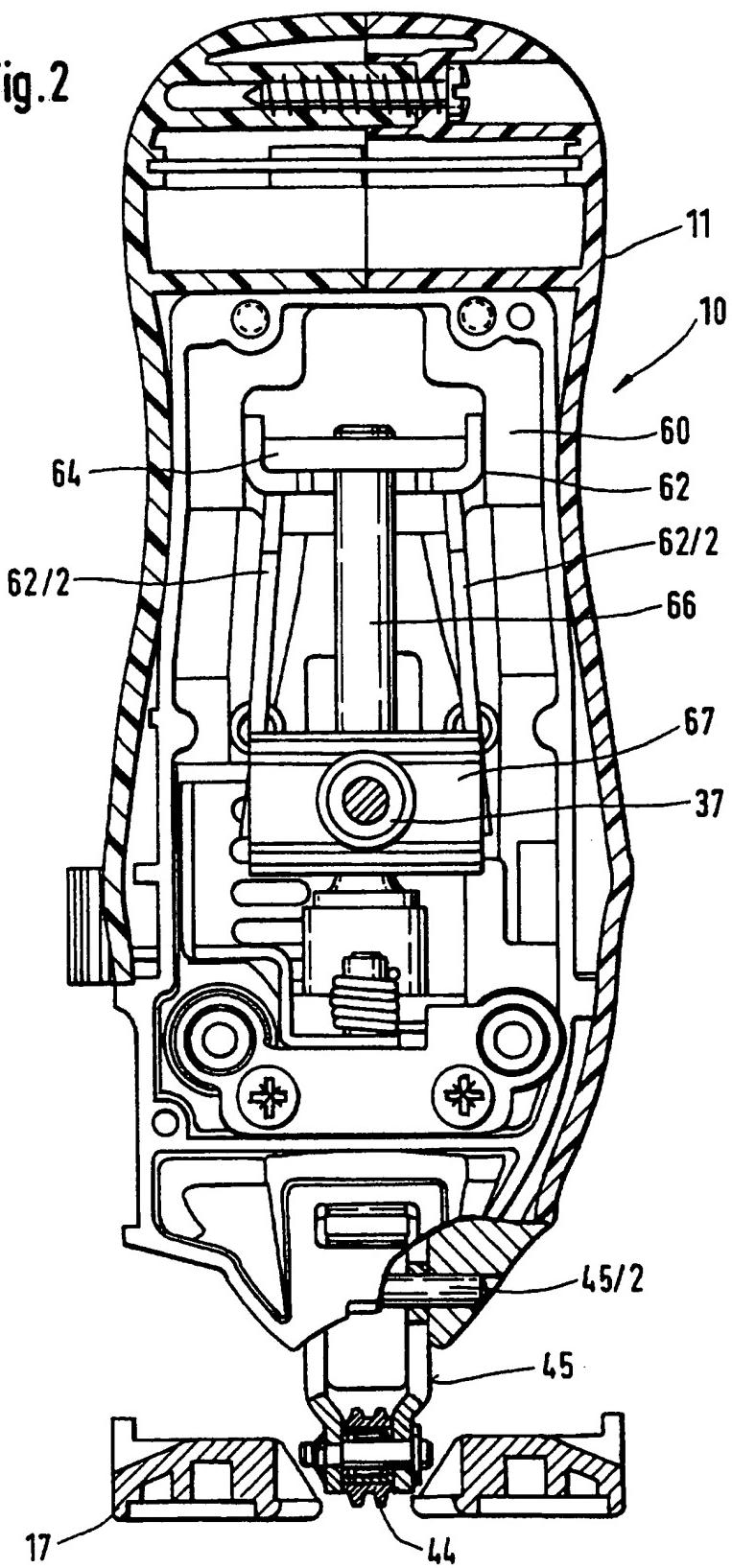
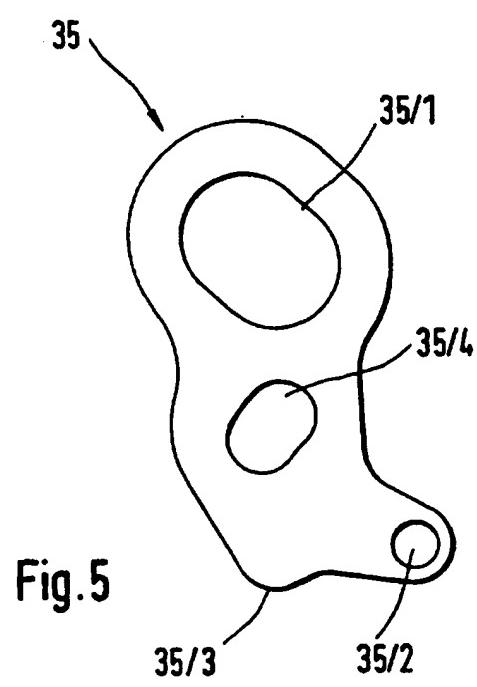
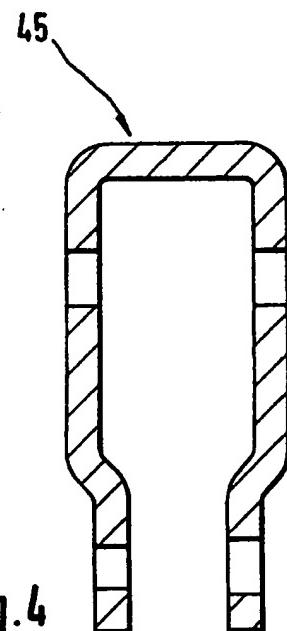
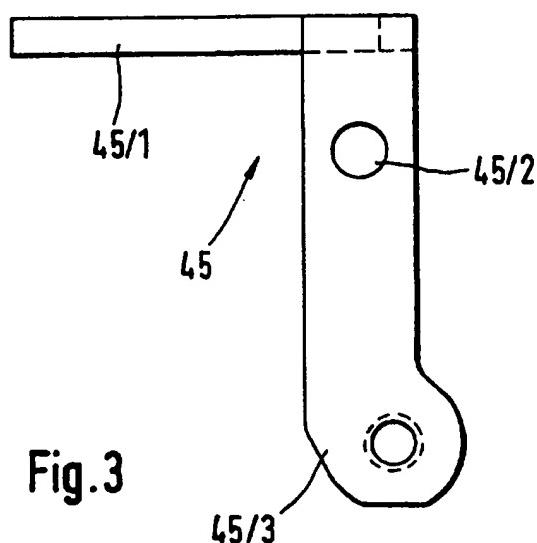


Fig.2



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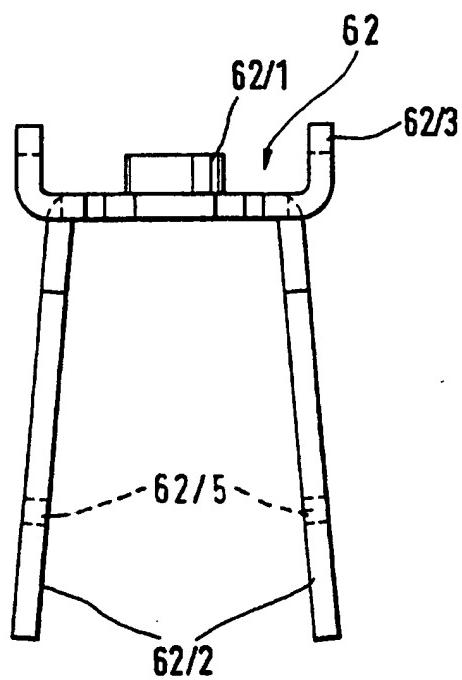


Fig. 7

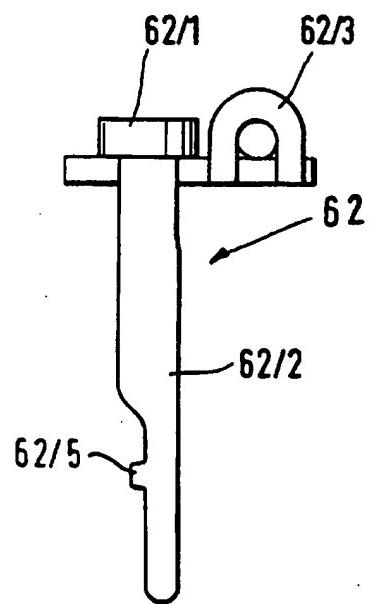


Fig. 8

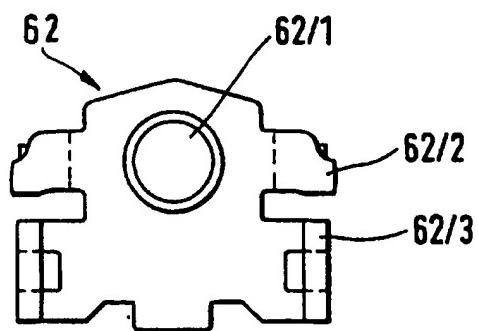


Fig. 9

HAND-GUIDED JIG SAW MACHINE

Background art

The invention proceeds from a jig saw machine according to the preamble of claim 1.

Hand-guided jig saw machines are known which impart to their saw blades, in addition to the vertical reciprocating motion, a horizontal oscillating motion which is superimposed on the vertical saw motion.

The oscillating motion is transmitted from an oscillating mechanism to the saw blade in that, for example, an eccentric motion is transmitted from the eccentric of an eccentric gear wheel, which is drivable in a rotating manner and generates the saw motion, to a forked lever having an open fork for engagement of the eccentric. The eccentric engages into a link opening of the pivotally supported forked lever and imparts to the latter a reciprocating swivelling motion.

The forked lever projects with its reciprocating swivelling end from the gearbox and is supported with said end directly on one arm of a two-armed roller lever, which is in turn mounted so as to be capable of swivelling at right angles to the swivelling plane of the forked lever. Rotatably mounted on its other arm is a supporting and/or oscillating roller, by means of which the roller lever is supported against the back of the saw blade and transmits its oscillating motion to said saw blade.

As a result of the oscillating engagement and disengagement of one end of the forked lever into and out of the gearing area, a relatively large through-gap has to be elastically sealed in an elaborate manner to prevent dust from entering and lubricant from escaping. In addition, transverse forces are transmitted from the forked lever to the roller lever, which lead to undesirable lateral vibration of the roller lever and tend to move said lever with its roller out of the oscillating plane. There is therefore a risk of the saw blade being deflected at right angles to the

forward feed direction or vibrating at right angles to the oscillating direction, resulting in a marked reduction in the accuracy and efficiency of the saw cut.

In the known jig saw, moreover, the top lifting rod bearing arrangement mounted in an oscillating manner is of a two-part construction: a first part of the lifting rod bearing arrangement carries a sliding bearing bush so that it may, together with the lifting rod, follow the latter's oscillating stroke. In a separate part, supporting brackets are provided. Against the latter a sliding block non-rotatably connected to the lifting rod and having lateral shoulders is supported in a locked manner in order to absorb the torque, which arises when sawing curves and is transmitted via the saw blade to the lifting rod, to prevent rotation of the lifting rod and hence to support the saw blade with a consistently precise stiffness when cutting curves.

Advantages of the invention

In contrast, the jig saw according to the invention having the characterizing features of claim 1 has the advantage that the gearbox may be better sealed off from the outside and is better able to absorb the torque which is transmitted, when sawing curves, from the saw blade to the lifting rod. Furthermore, the oscillating stroke may be transmitted without transverse forces to the saw blade, thereby reliably ruling out lateral vibration of the saw blade. As a result, sawing progress is improved and saw blade wear is reduced.

By virtue of the fact that the oscillating motion is transmitted without lateral vibration, the risk of the saw blade breaking when sawing metal is reduced.

By virtue of the fact that an axially displaceable push rod is disposed between the forked lever and the roller lever, the forked lever being disposed inside and the roller lever outside of the machine housing without either of the two levers passing through the machine housing, the gearbox may be sealed

particularly easily and effectively or its previously very elaborate sealing is simplified because it is only the small push rod moving up and down like a piston which has to be sealed off relative to the gearing area and not, as before, an oscillating part.

By virtue of the fact that the forked lever embraces the eccentric in a link-like, closed ring-like and not open fork-like manner, its strength is achievable with a lower material outlay and the conversion of the eccentric rotation of the eccentric into an oscillating motion is in particular constantly guaranteed.

By virtue of the fact that the forked lever, which is in particular drivable in an oscillating manner at right angles to the oscillating plane of the roller lever, carries between one side remote from the eccentric and its fulcrum a lug, which is supportable on the push rod, in particular on the latter's top end, and hence drives the push rod in a reciprocating manner, the partially sliding, oscillating motion of the forked lever is faultlessly transmittable to the push rod.

By virtue of the fact that the forked lever is one-armed and provided with a fulcrum as well as an oblong hole-like region, with which it embraces in a ring-like, link-like manner an eccentric of the drive wheel for the sawing stroke of the lifting rod and converts the rotating motion of the eccentric into the oscillating motion which it transmits by means of an edge of its periphery via the push rod to the roller lever, it is possible for the forked lever to be of a particularly small and lightweight design.

By virtue of the fact that the forked lever carries a recess with which it embraces, preferably without contact during its oscillation, the output shaft, it may be kept lighter and be housed in a space-saving manner inside the gearing area.

By virtue of the fact that the lifting rod is connected rigidly, in particular non-detachably by a weld joint, to a sliding block, which is disposed at right angles to its axis and by means of which, in particular by means of the outer shoulder-like ends thereof, the lifting rod is supported against two supporting

limbs, the locking against rotation of the lifting rod is particularly effective and possible without reaction on the housing.

By virtue of the fact that the lifting rod is guided at a single supporting bracket having two supporting limbs integrally disposed thereon and may be supported with its sliding block at the rear against said supporting limbs so as to be locked against rotation, a precise, torsional vibration-free sawing of curves is possible because the lifting rod and hence the saw blade may rotate only minutely relative to the jig saw.

By virtue of the fact that the supporting bracket mounted like a rocker in the housing is manufactured in one piece from a single punched and bent part, it is particularly inexpensive to manufacture and takes over the function previously performed by at least two separate parts, the oscillating return stroke of the lifting rod moreover being realized by spring supporting of the supporting bracket or its sliding limbs relative to the inner front wall of the gearing area.

Drawings

There follows a description of an embodiment of the invention with reference to the accompanying drawings.

The drawings show:

Figure 1 a longitudinal section of the jig saw according to the invention,

Figure 2 a cross section of the jig saw in the region of the lifting rod,

Figures 3 and 4 a side and front view of the detail of a roller lever,

Figure 5 the detail of a forked lever,

Figure 6 the detail of a pin as a motion-transmitting element between forked lever and roller lever; and

Figures 7 to 9 are enlarged front, side and plan views of a supporting bracket.

Description of the embodiment

The longitudinal section of a hand-guided jig saw machine 10 illustrated in Figure 1 shows its machine housing 11, which carries a motor 13 and, in the gearbox 25, a gearing 14 which transmits the rotation of the motor 13 to a lifting rod 66 and to a saw blade 68 clamped to the bottom end of the lifting rod 66. The machine housing 11 is disposed in an angularly adjustable manner on a foot plate 17 so that it may be securely placed and guided on a workpiece (not shown).

The motor 13 comprises a motor shaft serving as drive shaft 15, which is rotatably mounted in a shaft bearing 16 in the machine housing 11. The drive shaft 15 terminates in a drive pinion 18, which meshes with a spur gear wheel 33, which is mounted in the gearbox 25 so as to be rotatable about an axle 34.

At its face directed towards the motor 13, the spur gear wheel 33 carries an eccentric 36 in the form of a collar, which engages in a guided manner into an oblong hole-like recess 35/1 (Fig. 5) of a forked lever 35.

At its front face remote from the motor 13, the gear wheel 33 carries an eccentrically disposed crank 37, which engages into an oblong hole-like sliding block 67, which is in particular non-rotatably connected to the lifting rod 66, and converts the rotation of the gear wheel 33 into a vertical reciprocating motion of the lifting rod 66.

The lifting rod 66 is mounted so as to be longitudinally displaceable to and fro in a top supporting bracket 62 carrying a bearing bush 62/1 (Fig. 7) in the gearbox 25. The supporting bracket 62 is mounted in the gearing area 60 of the jig saw machine 10 so as to be capable of swivelling about a pin 64, which is mounted parallel to the foot plate 17 and at right angles to the longitudinal axis

1 1/2 of the machine housing 11. The pin 64 forms the fulcrum for the oscillating motion of the saw blade 68 jointly with the lifting rod 66.

The supporting bracket 62 carries two supporting limbs 62/2 (Figures 2, 7, 8), which extend downwards symmetrically relative to the centre of the bearing bush 62/1 and at right angles to the longitudinal axis 1 1/2 of the machine housing 11 and have mandrel-like centring lugs 62/5, between each of which and the inner front wall of the gearbox 25 a pressure spring 62/4 is supported and tends to press the supporting bracket 62 like a rocker jointly with the lifting rod 66 backwards about the axis of the pin 64. Thus, after each oscillating stroke in forward feed direction, the lifting rod 66 jointly with the saw blade 68 is pressed back by the action of the pressure springs 62/4, in which case via the back 70 of the saw blade 68 the roller lever 45 is likewise pressed backwards and consequently the push rod 51 is pressed up against the lug 35/3 of the forked lever 35 and follows the latter or its lug 35/3 during the oscillating motion in an upward direction.

The supporting limbs 62/2 are disposed in such a way that the sliding block 67, which likewise extends at right angles to the longitudinal axis 1 1/2 of the axis of the machine housing 11, is securely supported from the rear with its two outer ends or shoulders against the supporting limbs so that the lifting rod 66 during its up-and-down motion slides with its sliding block 67 guided against rotation along the supporting limbs 62/2. Thus, a particularly rugged, anti-rotation supporting bearing for the lifting rod 66 is provided in order to absorb the torque, which arises when cutting curves with the hand jig saw 10 and is transmitted via the jig saw blade 68 to the lifting rod 66. The supporting bracket 62 prevents distortion of the gearbox when sawing curves, allows a lightweight construction and an extended life of the gearbox and moreover via its sliding limbs 62/2 transmits the oscillating return stroke to the lifting rod 66.

The eccentric 36 at the rear face of the gear wheel 33 transmits its rotating motion upon rotation of the gear wheel 33 to the one-armed forked lever 35, so

that the latter oscillates about a fulcrum 35/2 and, in so doing, transmits its reciprocating swivelling motion by means of its lug 35/3 (Figure 5) to a push rod 51. The push rod 51 is moved up and down during the reciprocating swivelling motion of the forked lever 35 by the latter's lug 35/3, which slides in an oscillating manner over the top end of the push rod 51. With its bottom end, the push rod 51 is supported on an angular arm region 45/1 of a roller lever 45. The latter is mounted in the gearbox 60 so as to be capable of swivelling about a fulcrum 45/2 and at its bottom end 45/3 rotatably accommodates a roller 44. The roller 44 is supported against the back 70 of the saw blade 68. The roller lever 45 in the course of its swivelling motion about the fulcrum 45/2 imparts to the saw blade 68 an oscillating motion, which extends parallel to the longitudinal axis 11/2 of the machine housing 11.

The saw blade 68 is releasably clamped in the bottom end of the lifting rod 66 in a clamping device 12. The forked lever 35 is mounted by its oblong hole 35/1 in an overlapping, slidable manner onto the eccentric 36 of the gear wheel 33.

The push rod 51 projects in a sealed manner from the gearbox 60 and is in contact at one end with the roller lever 45 and at the other end with the forked lever 35, so that neither the forked lever 35 nor the roller lever 45 need engage through the gearbox 60 during their oscillating motion. Thus, the sealing of the gearbox 60 for passage of the push rod 51 is particularly simple and effective because it may be kept cylindrical and correspondingly small. In addition, the push rod 51 may transmit only a purely axial motion and no transverse force to the roller lever 45 so that the oscillating motion of the roller lever is effected extremely cleanly, without lateral vibrations.

The cross section of the jig saw 10 illustrated in Figure 2 shows far more clearly than in Figure 1 the gearbox 60, which in its upper region accommodates in a rotatable manner the pin 64, about which the supporting bracket 62 may

swivel jointly with the lifting rod 66. There is a particularly clear view of the two downward-directed supporting limbs 62/2, which are arranged symmetrically relative to the lifting rod and against which is supported the sliding block 67, into which the crank 37 engages in a link-like manner.

Also particularly clear is the construction of the roller lever 45 and of the roller 44 provided with a central annular groove (not numbered) for supporting the saw blade 68, as well as the swivelling axle 45/2 of the roller lever 45, about which the latter executes its oscillating motion.

Figure 3 shows a side view of the roller lever 45, of which the horizontal angle lever region with the limb 45/1 for taking up the up-and-down motion of the push rod 51 is clearly visible, as is the bore for receiving the axle 45/2 in the right-angled, downward-directed limb region 45, which at its bottom end 45/3 carries a bore (not numbered) for receiving the axle of the oscillating roller 44.

Figure 4 shows a plan view of the roller lever 45, which clearly reveals the two-limbed construction of its bottom limb region and the possibility of its taking the form of a punched and bent part.

Figure 5 shows a side view of the forked lever 35 with its oblong hole 35/1 for embracing the eccentric 36 of the gear wheel 33, with a recess 35/4 for the contactless embracing of the pinion 18, as well as its fulcrum 35/2, about which the forked lever 35 may execute its swivelling motion in order to press with its lug 35/3, which is disposed at the bottom in the vicinity of the fulcrum 35/2, onto the top end of the push rod 51 and convert its oscillating motion into a reciprocating motion.

Figure 6 shows the push rod 51 as a detail, the convex bottom end and the flat top end of said push rod being visible. The convex end is supported on the limb 45/1 of the roller lever 45, while on the flat end the lug 35/3 of the forked lever 35 is partially slidingly supported and as a result of the latter's oscillating motion moves the push rod 51 up and down. In the course of its up-and-down

motion, the push rod 51 sets the roller lever 45 into lateral vibration-free oscillating motion.

Figure 7 shows the detail of the supporting bracket 62, its bearing bush 62/1 in the top region and, laterally offset thereto, sleeve-like mounting brackets 62/3, by means of which the supporting bracket 62 embraces the pin 64 and may swivel in an oscillating manner.

It is clear from Figures 7, 8 and 9 that the supporting limbs 62/2 form downwardly bent regions 62/2 of a punched and bent part, against which regions the sliding block 67 may be supported, and that said part is inexpensive to manufacture.

Claims

1. Hand-guided, motor-driven jig saw machine (10) having a machine housing (11), in particular having a motor (13) mounted therein, and having a lifting rod (66) preferably driven by the motor (13) and movable up and down in a guided manner therein, which at its bottom end carries a saw blade (68) held in particular by a clamping device (12) with a clamp sleeve as a releasable holder, wherein close to the bottom end of the lifting rod (66) a roller lever (45) is mounted so as to be capable of swivelling in forward feed direction and is drivable in an oscillating manner, preferably by means of an eccentric (36) rotatable by the motor (13) and by means of a forked lever (35) which may be swivelled by the eccentric, wherein the back (70) of the clamped saw blade (68) is supportable, in particular positively guided in an annular groove, against an oscillating roller (44) of the roller lever (45), characterized in that a push rod (51), which in particular is driven like a piston in a vertically reciprocating manner by the forked lever (35) and is longitudinally guided in a sealed manner against the machine housing (11), transmits the oscillating motion between the forked lever (35) and the roller lever (45), preferably driving the roller lever (45) in an oscillating manner.
2. Jig saw machine according to claim 1, characterized in that the forked lever (35) embraces the eccentric (36) in the manner of a closed ring.
3. Jig saw machine according to claim 1, characterized in that the forked lever (35), which in particular is drivable in an oscillating manner at right angles to the oscillating plane of the roller lever (45), carries a lug, which is

supportable on the push rod (51), in particular on its top end, and preferably therefore drives the push rod (51) vertically.

4. Jig saw machine according to claim 3, characterized in that the forked lever (35) is of a one-armed construction and is provided with a fulcrum (35/2) as well as an oblong hole-like region (35/1), with which it embraces in a ring-like, link-like manner the eccentric (36) of a driving wheel (33) for the sawing stroke of the lifting rod (66) and oscillates as a result of the rotating motion of the eccentric (36), the forked lever transmitting the oscillation by means of its free end via the push rod (51) to the roller lever (45).
5. Jig saw machine according to one of the preceding claims, characterized in that the forked lever (35) between a side remote from the eccentric (36) and its fulcrum (35/2) carries, as a free end, the lug (53/3) in the form of a curved projection which is supportable on the push rod (51).
6. Jig saw machine according to one of the preceding claims, characterized in that the forked lever (35) carries a recess (35/4), with which it embraces, preferably without contact during its oscillation, the output shaft (15).
7. Jig saw machine according to one of the preceding claims, characterized in that the forked lever (35) is disposed inside the machine housing (11) and the roller lever (45) is disposed outside of the machine housing (11), without either of the two levers (35, 45) passing through the machine housing (11).
8. Jig saw machine according to the preamble of claim 1, in particular according to one of the preceding claims, characterized in that the lifting

rod (66) is mounted in a guidable manner in a single, bearing block-like supporting bracket (62), which in particular is mounted so as to be capable of oscillating at right angles to the lifting rod (66) and is connected, preferably integrally, to supporting limbs (62/2), in particular in a bearing bush (62/1), and is locked against rotation against the supporting limbs (62/2).

9. Jig saw machine according to claim 8, characterized in that the lifting rod (66) is connected rigidly, in particular non-detachably by a weld joint, to a sliding block (67), which is disposed at right angles to its axis and by means of which the lifting rod (66) is supported against the supporting limbs (62/2).
10. Jig saw machine according to claim 9, characterized in that the lifting rod (66) is supported by means of the outer, shoulder-like ends of the elongate sliding block (67) against the supporting limbs (62/2).
11. A hand-guided, motor driven jig saw machine substantially as herein described with reference to the accompanying drawings.



The
Patent
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13.

Application No: GB 9804033.0
Claims searched: 1-11

Examiner: R.B.Luck
Date of search: 29 April 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P):

Int Cl (Ed.6):

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
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A	EP0151524 (Black & Decker Inc)	
A	EP0042010 (Black & Decker Inc)	

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